[0081] Referring to FIG. **8**, when an "h" value of a first virtual block **810** is represented with "h_1", an "h" value of a second virtual block **820** indicates a difference between a road surface height in the second virtual block **820** and a road surface height in the first virtual block **810** and is represented with "h_2". In the same manner, an "h" value of a third virtual block **830** indicate a difference between a road surface height in the third virtual block **830** and a road surface height in the second virtual block **820** and is represented with "h_3"; and an "h" value of a fourth virtual block **840** indicate a difference between a road surface height in the fourth virtual block **840** and a road surface height in the third virtual block **830** and is represented with "h_4". In other words, a value of "h_n" in the n-th virtual block is a difference between a height of the (n−1)-th virtual block from a ground and a height of the n-th virtual block from the ground. For each virtual block, the "h" value may be predetermined and the amplitude of a vibration signal may be adjusted based on the magnitude of the "h" value.

[0082] Meanwhile, in Equation (1), Vib(L) indicates a pattern of the vibration signal and is expressed in a square wave. Alternatively, Vib(L) may be expressed in the sum of a plurality of sine waves.

[0083] When a user plays a game while controlling the speed of a car using the controller **540** in the above-described game environment, the car information calculator **545** obtains a position and a speed of the car using the moving speed and acceleration of the car. Here, the moving speed and the acceleration may be obtained by the car information calculator **545** sensing the number of times or a period of time that a speed increase or decrease button in the four direction button unit **520** or the number button unit **530** is pressed and obtaining speed or acceleration predetermined corresponding to a sensing result. The road surface information calculator **550** provides information on a road surface at a position of the moving car.

[0084] The graphic display module **555** displays a graphic screen according to the position and the speed of the car.

[0085] The rendering module **560** receives the position and the speed of the car from the car information calculator **545** and the information on the road surface from the road surface information calculator **550** and generates a rendering signal for providing a haptic signal based on the received information. Here, the position and the speed of the car is provided as frequency information used to generate a vibration signal and the information on the road surface is provided as amplitude information used to generate the vibration signal.

[0086] The drive circuit **565** generates a drive signal for driving the actuator **570** based on the rendering signal so that the actuator **570** generates the vibration signal. The drive signal includes a voltage or current signal for example.

[0087] The generated vibration signal is transmitted to the controller **540** so that the user can feel vibration. Consequently, since the frequency and the amplitude of the vibration change according to the speed of the car operated by the user and the information on the road surface, various vibration effects are provided.

[0088] FIG. **9** illustrates a user interface system according to another embodiment of the present invention, in which a navigation system **900** is illustrated by way of example.

[0089] Referring to FIG. **9**, the navigation system **900** displays a map and provides a display screen **920** including a pointer **910** pointing at a current position **912** of a user. The pointer **910** corresponds to an interface object. Here, the display screen **920** may be implemented by a touch screen.

[0090] In this case, as a touch by the user's finger moves, the pointer **910** also moves. A road on the map displayed on the display screen **920** has different road surface information. The road surface information is a parameter determining the amplitude of a vibration signal. In addition, the color of a road on the map displayed on the display screen **920** may be changed according to traffic on the road. For example, when traffic on a road is very heavy, the road may be colored in red. When the traffic is a little heavy, the road may be colored in yellow. When the traffic flows smoothly, the road is colored in blue. In this situation, it is assumed that information on the height of a road changes according to color. Here, color may be a parameter determining the amplitude of a vibration signal.

[0091] When the user moves a touch of the finger from the current position **912** to a target position **914**, the frequency of a vibration signal is determined according to a moving speed. The amplitude and the frequency of the vibration signal are determined in the same manner as that used in the game device **500** according to the previous embodiment. Since the navigation system **900** uses a touch screen as an input/output interface, the user can feel vibration through the finger touching the touch screen.

[0092] FIG. **10** illustrates a user interface system according to still another embodiment of the present invention, in which a computer system **1000** uses a mouse **1020** as an input device.

[0093] Referring to FIG. **10**, a display device **1030** included in the computer system **1000** displays a pointer **1010** pointing at a current position **1012**. The pointer **1010** corresponds to an interface object and changes in position and speed according to the operation of an input interface device, i.e., the mouse **1020**.

[0094] In this case, a graphic screen displayed by the display device **1030** has different surface information. The surface information is a parameter determining the amplitude of a vibration signal. In addition, when a user moves the pointer **1010** from the current position **1012** to a target position **1014** using the mouse **1020**, the frequency of the vibration signal is determined according to a moving speed of the pointer. The amplitude and the frequency of the vibration signal are determined in the same manner as that used in the game device **500**. In the computer system **1000**, the user can feel vibration through the mouse **1020**. Here, the mouse **1020** may include the interface device module **110** and the drive module **150** illustrated in FIG. **1**.

[0095] According to the present invention, more interactive and realistic operation feelings are provided to a user when the user operates a graphic object on a graphic screen.

[0096] While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the following claims. It is therefore desired that the present embodiments be considered in all respects as illustrative and not restrictive, reference being made to the appended claims rather than the foregoing description to indicate the scope of the invention.

What is claimed is:

1. A user interface system comprising: